Southeast Alaska

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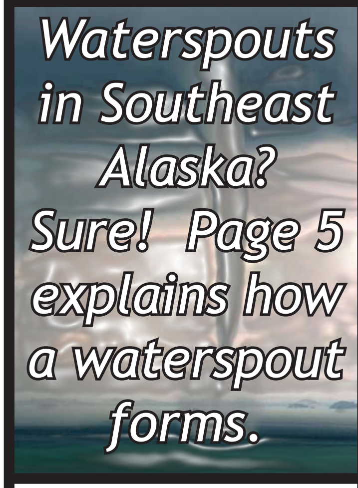

In This Issue:

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Cloudburst Chronicle Returns

By Tom Ainsworth

With the arrival of this edition of the *Cloudburst Chronicle*, you are probably thinking, “Gee, I haven’t seen one of these in a while.” And you are right. This is the first edition of *Cloudburst Chronicle* since July 2008. The lack of newsletters the past two years was not planned or expected. Life just happened. A steady stream of changes and events kept the next *Cloudburst* on the back burner.

Soon after the July 2008 *Cloudburst Chronicle* was issued, there were several staffing changes at the office. During the time it takes to hire new staff, the rest of us have to keep forecasting which leaves less time for writing *Cloudburst Chronicle* articles. After we returned to ‘full strength’ new office projects took on higher priorities. One example has been this office’s emphasis at developing a numerical weather forecast model that runs on a PC here in the office. This required months of effort from a team of individuals. Check out the article about numerical weather models on page two to learn more about these fundamental tools and how they have evolved and improved over time. Another significant accomplishment for our office was implementing “point and click” forecasts. This is a web application (http://weather.gov/juneau/ifpsLooper/ifpsLooper.php) that queries our digital forecast database of over 90,000 individual grid points within our forecast area of responsibility and displays the forecast for that point in several different formats for you to choose from: text, tabular, or a time series graph. Calibrating the database and the high resolution graphical forecasts over the complex topography and geography of Southeast Alaska was a significant achievement for the Juneau Forecast Office staff. And there is still much work to do. If you are a Cooperative Observer or Weather Spotter for our office, your observations of conditions in remote and otherwise data-less locations are helping us fine tune our models and digital forecast services.

So, while we may not have sent you the *Cloudburst Chronicle* in many months, please know over that time we were thinking of you and depending on your valuable contributions to the intricate process of weather forecasting. Thanks for your help. I hope you enjoy this edition of the *Cloudburst Chronicle*!

Numerical Weather Models and How They Contribute to Southeast Alaska Forecasts

By Cory Van Pelt

In 1904, the Norwegian physicist and meteorologist Vilhelm Bjerknes proposed the idea of taking current weather observations, plugging the values into the complex equations that govern atmospheric behavior, and solving them for a future time to produce a weather forecast. Without the benefit of computers, instituting this method of weather forecasting was impossible.

At the end of World War II, the first electronic computer was invented named ENIAC. This computer was large (taking up the space of a 30 by 50 foot room), suffered from constant breakdowns, and used vacuum tubes which required round-the-clock maintenance and replacement. In 1948, a team was assembled by the computer scientist John von Neumann at Princeton University to develop a simplified set of equations that would be incorporated into the world's first mathematical model of the atmosphere, to be run on the ENIAC. This effort culminated in the first successful weather forecast produced by a computer in April 1950.

Today, several different models are run four times per day on a supercomputer at the National Weather Service's (NWS) National Centers for Environmental Prediction (NCEP) in Camp Springs, Maryland that form the basis of modern weather forecasting. The NWS' current supercomputer, named Stratus, is capable of 69.7 trillion calculations per second. It would take one person with a calculator around 3 million years to perform the number of computations that Stratus makes in one second.

At the beginning of each new model cycle, over 200 million surface, aviation, marine, upper air, and satellite observations from around the world are ingested into the computer models at NCEP. These model systems begin with a short-term model forecast (called a "first guess") produced from an earlier model run, and then combines the observations with the first guess to come up with a final initial analysis. Automated quality control processes will reject observations that are out of tolerance with neighboring observations, which prevents bad data from being ingested into the model and degrading the forecast.

The computer models are composed of a mesh of grid points situated over a computer version of the Earth, both in the horizontal and vertical, forming a series of grid boxes. In each grid box, the equations of the atmosphere are solved beginning with the new model analysis mentioned above, and integrated forward over very small increases in time. The calculated weather passes from one grid box to the next, and this process continues until a several-day forecast is completed. The results of the model computations are delivered to NWS Forecast Offices for ingestion into the

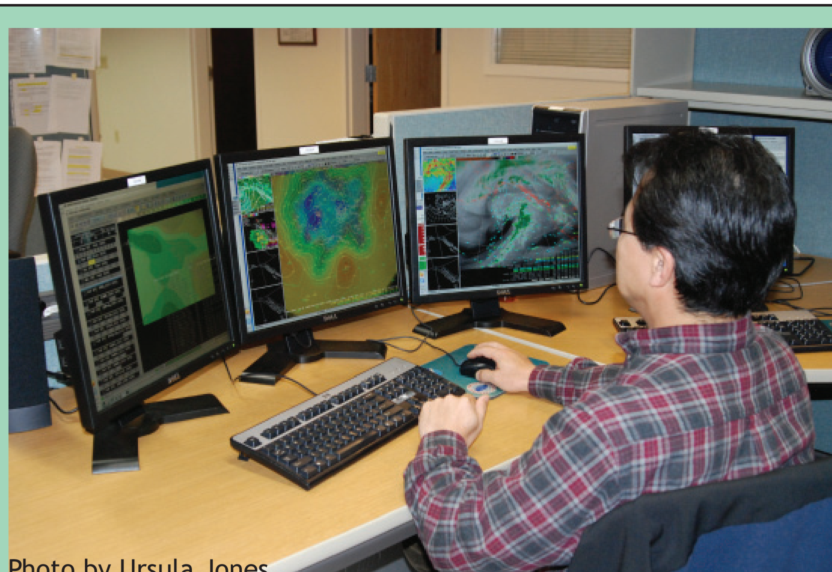
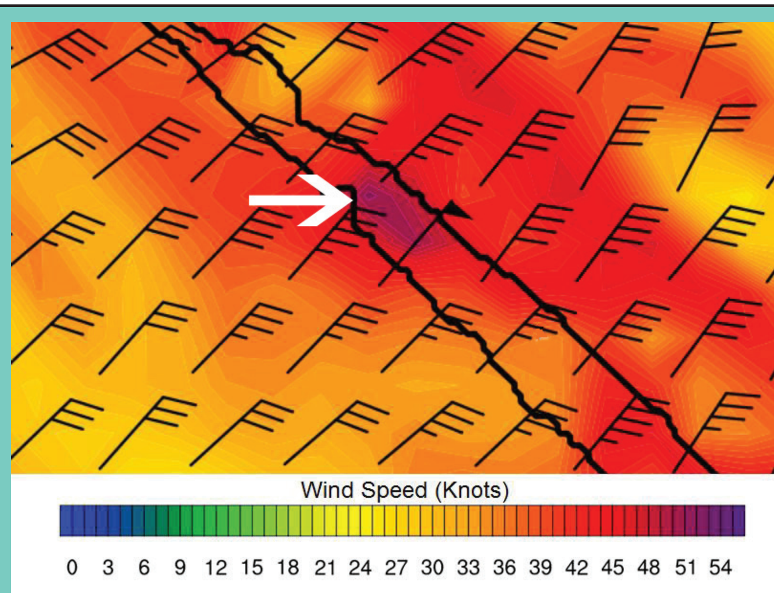


Photo by Ursula Jones

Stephen Ahn, Lead Forecaster, works with AWIPS and GFE to create the long-term forecast at WFO Juneau.

Advanced Weather Interactive Processing System (AWIPS), and the Graphical Forecast Editor (GFE), which are the main tools used to produce NWS forecasts.

The three main NCEP models that are currently used are the NAM (North American Mesoscale), RUC (Rapid Update Cycle), and the GFS (Global Forecast System). The NAM uses a grid point mesh that covers North America and is run 84 hours into the future. The RUC also covers North America but is only run out to 12 hours. The GFS domain encompasses the entire Earth, and produces weather forecasts out to 16 days in the future for any point on the globe. The Juneau Forecast Office uses the NAM and GFS, as well as ocean wave models that help forecast wave height and swell. In addition, we use data produced from global-scale models received from the European Center for Medium-Range Weather Forecasts, the UKMET model from the United Kingdom Meteorological Office, and the Global Environmental Multiscale model run by the Canadian Meteorological Center.



A wind forecast produced by a WRF numerical model on October 13, 2009. The high resolution of the model (grid points every 2,400 feet) allowed it to correctly forecast winds in excess of 70 MPH in Gastineau Channel, near Douglas, Alaska 21 hours beforehand.

Thanks to exponential increases in the speed of personal computers over the past decade, weather forecast models for smaller geographic areas can now be run at local Forecast Offices. The main model that's used at offices across the country is the Weather Research and Forecasting (WRF) model, which was developed by National Oceanic and Atmospheric Administration, Federal Aviation Administration, Navy, Air Force, and the National Center for Atmospheric Research, and was intended as a model that both researchers and forecasters can use. The WRF is unique in its "plug and play" architecture, which allows local offices to tailor their model configurations with different physics options, horizontal grid spacing, number of vertical levels, and forecast domains.

WFO Juneau has been running the WRF over Southeast Alaska since 2006. It is currently configured with a grid point spacing of 4 kilometers (2.5 miles), and is run twice per day on computers located in the office. The 2.5 mile resolution allows the model to resolve, or "see", the complex terrain and narrow inner channels of the Panhandle better than the coarser resolution NCEP models, such as the NAM, which has a grid point spacing of 12 kilometers (7.5 miles). This greater resolution has proven beneficial in forecasting wind direction and speed in our inner channels.

Staff at WFO Juneau have been hard at work over the past few months, running case studies of past weather events using the WRF to better understand the processes behind local weather phenomena. Our studies have included such events as waterspouts in Lynn Canal, high winds in Skagway, and Taku wind storms and heavy snow events in Juneau.

To combine and expand these efforts, WFO Juneau has recently formed a Local Modeling Team, with the mission of using the WRF model to conduct further studies of small-scale weather events in Southeast Alaska, and provide feedback to regional and national offices on the performance of the larger-scale models. The team's goal is to help WFO Juneau forecasters better understand and forecast the relatively small-scale but significant weather events that are very familiar to Southeast Alaskans.

CoCoRaHS
By Nikki Becker

So, what is CoCoRaHS? It sounds like a type of cereal. Actually, it is an acronym for the Community Collaborative Rain, Hail, and Snow Network, which is a non-profit, volunteer network working together to measure and map precipitation.

This program is very similar to the National Weather Service's (NWS) Cooperative Observer Program (COOP). The COOP program, which dates back to 1890s, is a volunteer network of observers who report information to their local NWS Office. COOP observers, who are geographically spaced to represent different areas of a region, take temperature and precipitation observations once a day using NWS equipment. CoCoRaHS began in 1998 at the Colorado Climate Center at Colorado State University, after a major flood event in Fort Collins. The goal was to monitor daily precipitation within the state of Colorado. Since then, the network has partnered with NOAA and grown to over 12,000 volunteer observers in 42 states who take precipitation observations from their backyards. The data is used by many different user groups, including: National Weather Service; hydrologists; emergency managers; and farmers.


CoCoRaHS rain gauge

Anyone can join the CoCoRaHS network. The growing number of volunteers has filled in the gaps within the NWS COOP network. Currently, there are seven active CoCoRaHS observers in Southeast Alaska and 78 active observers in the state. The program is an excellent tool for teaching middle and high school students about weather, climate, and the value of contributing to a national network of weather observations.

If you are interested in sending your precipitation measurements, you can find out more about CoCoRaHS at http://www.cocorahs.org/. Remember that every raindrop and snowflake does count.

Work Cited

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Waterspouts

By Bruce B. Smith and WFO Juneau

Persons living in Southeast Alaska are well aware that topography has a profound impact on local weather patterns. Examples include: Taku winds, heavy rain, and distribution of snowfall to name a few. Another type of unique weather phenomena possible is the waterspout.

What is a Waterspout?

Dr. Joseph Golden, a distinguished waterspout authority with the National Oceanic and Atmospheric Administration (NOAA), defines the waterspout as a "funnel which contains an intense vortex, sometimes destructive, of small horizontal extent and which occurs over a body of water." The belief that a waterspout is nothing more than a tornado over water is only partially true. The fact is, depending on how they form, waterspouts come in two types: tornadic and fair weather.

Tornadic waterspouts generally begin as true tornadoes over land in association with a thunderstorm, and then move out over the water. They can be large and are capable of considerable destruction.

Fair weather waterspouts, on the other hand, form only over open water. They develop at the surface of the water and climb skyward in association with warm water temperatures and high humidity in the lowest several thousand feet of the atmosphere. They are usually small, relatively brief, and less dangerous. The fair weather variety of waterspout is much more common than the tornadic.

Waterspout formation typically occurs when cold air moves across warmer water and results in large temperature differences between the warm water and the overriding cold air. They also form where different wind flows converge in areas of complex terrain.

Individual waterspouts tend to last from about two to twenty minutes, and move along at speeds of 10 to 15 knots, but waterspouts can often reform in the same area for several hours.

Stages of Waterspouts: Dr. Joseph Golden distinguishes five stages of waterspout formation based on the following characteristics of the water where they form.

1. Dark spot - A prominent circular, light-colored disk appears on the surface of the water, surrounded by a larger dark area of indeterminate shape and with diffused edges.

2. Spiral pattern - A pattern of light and dark-colored surface bands spiraling out from the dark spot which develops on the water surface.

3. Spray ring - A dense swirling annulus (ring) of sea spray, called a cascade, appears around the dark spot with what appears to be an eye similar to that seen in hurricanes.

4. Mature vortex - The waterspout, now visible from water surface to the overhead cloud mass, achieves maximum organization and intensity. Its funnel often appears hollow, with a surrounding shell of turbulent condensate. The spray vortex can rise to a height of several hundred feet or more and often creates a visible wake and an associated wave train as it moves.

5. Decay - The funnel and spray vortex begin to dissipate as the inflow of warm, moist air into the vortex weakens.

How does the National Weather Service forecast waterspouts?

National Weather Service (NWS) meteorologists consider including waterspouts in the forecasts whenever large, cold air masses overspread the waters of Southeast Alaska.

Water temperature, air

Waterspout photo taken in Southeast Alaska.

temperature, moisture, and wind speed in the lowest several thousand feet of the atmosphere are among the parameters forecasters assess when determining the likelihood of waterspouts. Waterspouts become favorable when water temperatures are relatively warm, and the air is cold and moist. Research in Southeast Alaska indicates that waterspouts occur where locally strong winds merge and create a spinning vortex.

What forecasts and warnings are issued by the National Weather Service to warn of waterspouts?
Once the NWS has determined that waterspouts are possible, the threat is outlined in the Coastal Marine Forecast. The NWS strives to provide this information over VHF and the Internet. When waterspouts are detected by Doppler Radar or reported by local mariners, pilots, or spotters, the NWS issues a Special Marine Warning. Since it is not uncommon for numerous waterspouts to occur simultaneously over a large area, these warnings tend to cover large marine areas (e.g., "Clarence Strait") as opposed to tornado warnings which generally cover small, specific locations (e.g., "Admiralty Island near Angoon").

Waterspouts which make landfall are usually much weaker than tornadoes: they produce little or no damage and dissipate quickly. Once on land, they tend not to pose a threat to life and property. In these instances, the NWS issues a Severe Weather Statement. In very rare cases, stronger waterspouts may produce significant damage when making landfall. In these cases, the NWS will generally issue a Tornado Warning.

What should you do?
Take waterspouts seriously and respect their destructive potential. When warnings are issued for waterspouts, take note of your surroundings, prepare to quickly seek safe harbor, or to find shelter out of the path of the waterspout. Waterspouts travel at 10-15 knots and may travel faster than a boat is capable. Don't assume you can outrun a waterspout. Special Marine Warnings can remain in effect for up to two hours.

Your best source for marine weather forecast information is NOAA Weather Radio (NWR). These continuous broadcasts from transmitters scattered around Southeast Alaska provide forecasts and warnings 24 hours a day. NWR's broadcast on VHF frequencies between 162.40 and 162.55 MHz.

Notable Achievements

Wing Receives 30 Year Length of Service Award

By Ursula Jones

Established in 1963, the Auke Bay COOP is one our oldest COOP stations in Southeast Alaska. Dr. Bruce Wing witnessed the Auke Bay COOP equipment installation in 1963 and became the primary observer in July 1979, making him our longest running observer. In addition to having the most complete observation database in Southeast Alaska, the station has collected over 17,000 days of data with Dr. Wing personally ensuring that nearly 11,000 of those days were recorded.

His dedication and attention to detail is strongly reflected by the quality of data that is collected. Dr. Wing has aided in better forecasting and assisted in evaluating the extent of human impacts on climate from local to global scales. Congratulations on your 30 Year Length of Service Award and keep up the good work Dr. Bruce Wing!

Farewell to Dave Andresen

NWS's Tom Ainsworth and Kimberly Vaughan congratulated Dave Andresen for his years of service.

Annex Creek Power House recently lost a fine employee and the National Weather Service lost an excellent weather observer. Dave Andresen, our weather observer at Annex Creek, has retired.

For seven years, Dave reported weather observations, usual and unusual, with gusto. No matter what the weather - good or bad - Dave was always in a good mood when he called. In the 7 years Dave was at Annex Creek, he moved 1,886 inches (157 feet) of snow. WOW!

Dave, thank you for everything you have contributed! Best wishes to you and your family.

Notable Achievements cont.

Norwegian Sun Ship Award and Visit

By Ursula Jones

In 2009, Nikki Becker and Ursula Jones presented a Voluntary Observing Ship (VOS) Program award plaque to the cruise ship Norwegian Sun. The Norwegian Sun set new all time ship and company records in 2008 by taking 2,809 valuable marine weather observations. That's almost 10 reports a day! This is an increase of over 1,600 from 2007 when they received their first VOS award.

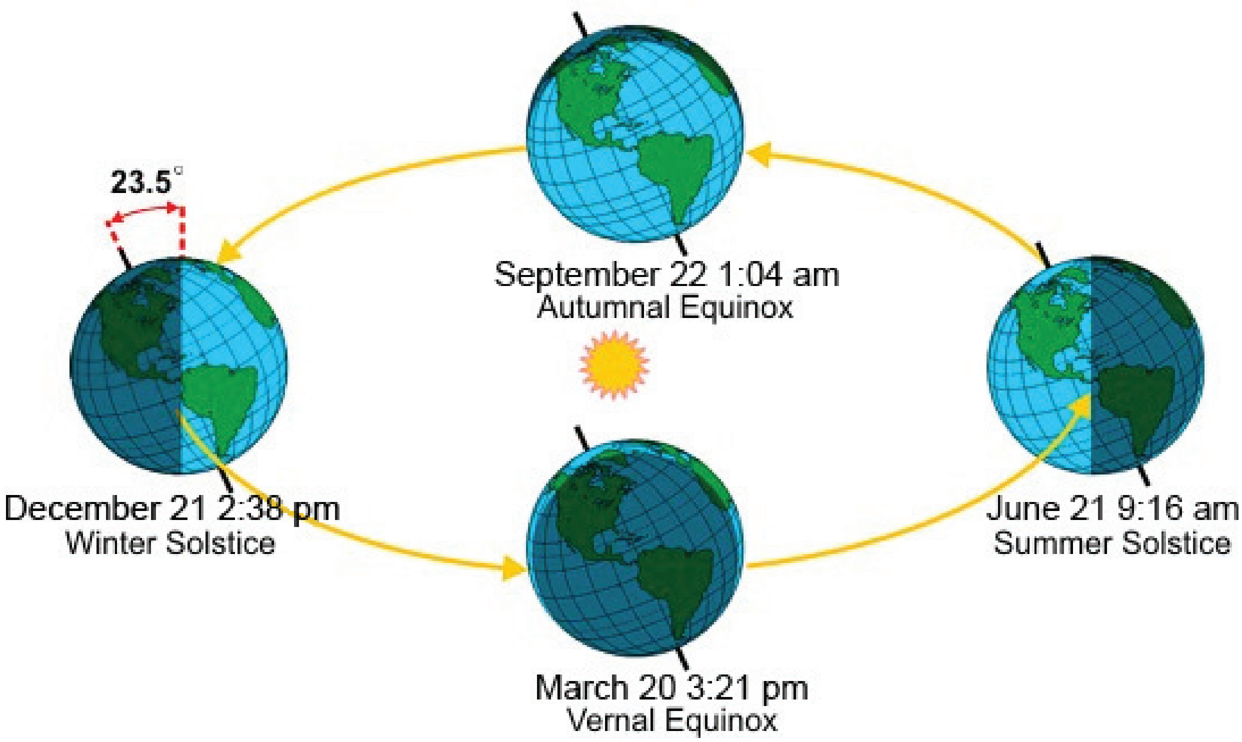
In addition to presenting them with their award, Nikki and I calibrated their barometer, discussed some of the recent weather we had, and learned about the various countries the crew hailed from. Like all the cruise ships I have visited, the crew was very easy to talk to and helped us accomplish everything we had hoped to.

Lightning Quick Facts

- Lightning often strikes the same place repeatedly if it is a tall, isolated object such as a ship mast.
- Most lightning victims are in open areas or near a tree.
- In Florida, lightning kills more people than all other storm-related weather events.
- Lightning can heat its path through the air to 50,000°F: five times hotter than the surface of the sun.

Solstice or Equinox?
By Weather Forecast Office Albuquerque, NM

The Earth makes a complete revolution around the sun once every 365.25 days, following an orbit that is elliptical in shape. The distance between the Earth and Sun, which is 93 million miles on average, varies throughout the year because the sun is not exactly centered in our orbit. During the first week in January, the Earth is at its closest point to the sun. This is referred to as the perihelion. The aphelion, or the point at which the Earth is about 1.6 million miles farther away from the sun, occurs during the first week in July. This fact may sound counter to what we know about seasons in the Northern Hemisphere, but actually the difference is not significant in terms of climate and is not the reason why we have seasons. Seasons are caused by the fact that the Earth rotational axis is tilted 23.5°. The tilt's orientation with respect to space does not change during the year; thus, the Northern Hemisphere is tilted toward the sun in June and away from the sun in December, as illustrated in the graphic below. The dates and times shown are Alaska times.



The summer solstice occurs when the sun is directly over the Tropic of Cancer, which is located at 23.5° North, and runs through Mexico, the Bahamas, Egypt, Saudi Arabia, India, and southern China. Because of the Earth's tilt, the sun was directly over the Tropic of Cancer at 3:28 p.m. ADT on June 21, 2010. For every place north of the Tropic of Cancer, the sun is at its highest point in the sky and this is the longest day of the year. The winter solstice occurs when the sun is directly over the Tropic of Capricorn, which is located at 23.5° south of the equator. Because of curvature of earth, locations north of 66.5° N are continuously shaded making for "24 hours of darkness".

There are two times of the year when the Earth's axis is tilted neither toward nor away from the sun, resulting in an equal amount of daylight and darkness at all latitudes. These events are referred to as equinoxes and occur near March 20 (Vernal Equinox) and near September 22 (Autumnal Equinox). At the equator, the sun is directly overhead at noon on the two equinoxes. The Autumnal Equinox occurred at 7:09 p.m. ADT on September 22, 2010. The Vernal Equinox will occur at 3:21 p.m. AST on March 20, 2011.

The Olympics - Not Just About Heroes and Heartbreaks

Contributing Authors - Carl Dierking, Ursula Jones, Mike Mitchell

The Winter Olympics were held in Vancouver, British Columbia in February and March 2010. This was the closest the prestigious world event has been to Southeast Alaska since the Calgary games in 1988. The Vancouver Games venues were close to sea level and the sea making weather information very important to the success of the Games. As it turned out, the mild La Niña winter contributed far below average snowfalls at the Olympic venues. Olympic organizers had no choice but to import snow to keep some ski and snowboard venues snow-covered.

Since January 2008, Carl Dierking (Science and Operations Officer for WFO Juneau) and Mike Mitchell (Lead Forecaster for WFO Juneau) have been training for the Olympics - for forecasting for the Olympics that is. Selected from a pool of 100 candidates, Carl and Mike were chosen by Environment Canada in October 2007 to be weather forecasters for the 2010 Winter Olympics and Paralympics.

Carl said that, "Providing forecasts for the Ski Jump was both interesting and challenging." During competitions, officials closely monitored the crosswind and upslope/downslope wind components at five different sensors on the mountain for both safety and fairness (upslope winds contributed to longer jumps). Carl's input was used to set narrow thresholds for each competition, typically allowing for a variation of only 2 meters per second. In addition, the grooming team needed accurate temperature and precipitation forecasts to keep the facility in top condition for events.

Mike performed his Paralympics forecasting duties at the heart of the Olympic forecasting process at the Environment Canada's Pacific Storm Prediction Center's (PSPC) Olympic Desk (POD). Located in the PSPC office in downtown Vancouver, the POD is responsible for providing short and long term meteorological guidance, coordinating daily forecasts issued for British Columbia with the five Olympic venue forecasters, and ensuring the media, world wide web, Vancouver Olympic Committee, and scientific community have access to the most current and accurate weather information available. The POD was staffed 24 hours per day, 7 days a week during both the Olympics and Paralympics by forecasters working 12 hours shifts.

It was a fast paced assignment that included maintaining an overall weather watch, detailed analysis of meteorological data, conducting multiple weather briefings to a variety of users each day, issuing an array of forecast products destined for the media and web, and ensuring the smooth operation and continuity of the Olympic forecast process. With such a responsibility and challenge, Mike considered it an honor to be part of the Olympic forecast team and considered it the highlight of his weather forecasting career.

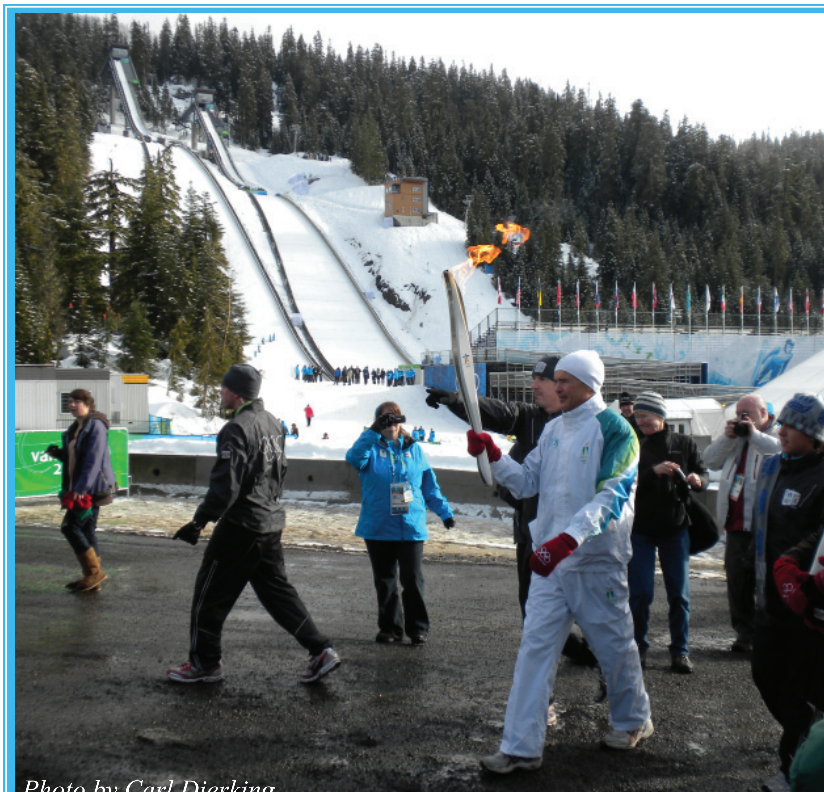


Photo by Carl Dierking

Olymic torch bearer with ski jump venue in background.


Photo by Ursula Jones

Southeast Alaska Winter Outlook for 2010-2011

by Rick Fritsch

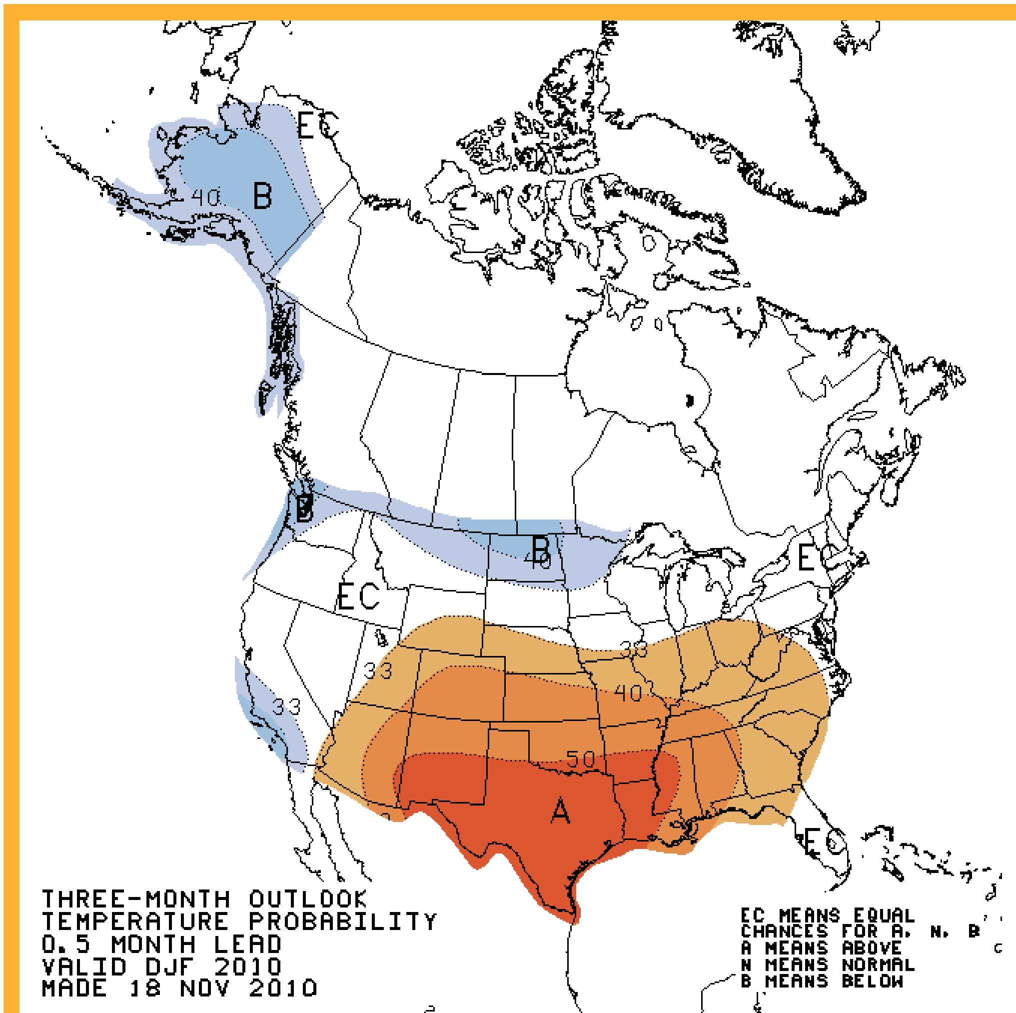
With winter upon us, many folks are wondering what to expect this year for seasonal snowfall. If you have been keeping up with the state of the climate, you are probably aware that we have entered a La Niña phase of the El Niño Southern Oscillation (ENSO for short). This does affect our winter weather, but perhaps not as much as was once thought.

La Niña is characterized by a tongue of cooler-than-normal ocean sea surface temperatures (SST) extending west from the west coast of South America. La Niña is part of a complicated air-sea interaction whose effects in Alaska are primarily felt in winter. Traditional thinking says that La Niña periods tend to produce cooler than normal winters over Southeast Alaska with the temperature departures from normal proportional to the strength of the La Niña. The strength of La Niña (and El Niño too) is given by something called the Oceanic Niño Index, or ONI, and gauged according to a particular region in the tropical Pacific Ocean called "Niño 3.4", which spans the Equator in the central Pacific from 120W to roughly 165W longitude. The ONI is defined as the 3-month running mean SST departure from normal in the "Nino 3.4" region. By definition, the ONI needs to be at least -0.5 degrees C to be an official La Niña and at least +0.5 to be an official El Niño. As of November, the Niño 3.4 value was -1.5 degrees C. This is considered borderline strong La Niña. Moreover, forecast models for ENSO are projecting the La Niña to continue or possibly become even stronger through early 2011. While an El Niño may last 9 to 12 months, La Niña typically lasts 1 to 3 years. This might sound ominous for those who do not like cold winters or may be cause for celebration if you like Winter weather. However, there is more to the story.

Preliminary research conducted at the Weather Forecast Office in Juneau suggests that, although there is a relationship between La Niña and average winter temperatures, that relationship is not very strong. The strength of this relationship is given by something called a correlation coefficient. In a perfect relationship, if "A" happens, then B" will always happen. The correlation coefficient for such a perfect relationship is 1.00. Research conducted thus far at the Juneau forecast office indicates that the correlation coefficient of La Niña to the departure from average winter temperature is 0.38. Additionally, there appears to be little to no relationship between La Niña and average winter precipitation amounts. The correlation coefficient of La Niña to winter precipitation in Juneau is only 0.06.

There is, however, another lesser-known air-sea interaction called the Pacific Decadal Oscillation, or PDO for short. It also has a warm and a cold phase. A warm phase, or positive PDO, is characterized by a stronger than normal "Aleutian Low" – a persistent area of lower atmospheric pressure centered near the Aleutian island chain. The resulting average surface winds tend to push warmer sub-tropical surface waters northward into the Gulf of Alaska. The net effect is warmer than normal sea surface temperatures in the gulf and greater incidence of warm, moist onshore low level winds along the outer coast. A cold phase (called a negative PDO) is characterized by a weaker than normal Aleutian Low and a higher incidence of cold, drier offshore northerly flow along the south coast and panhandle. The resultant surface wind stress over the gulf tends to promote upwelling of colder sub-surface waters and the net effect is cooler than normal sea surface temperatures in the gulf.

Currently there are no predictive models for the PDO; however, the cycle is long, as implied by the name: typically 20 to 30 years. A few years have been negative, but mostly, we have been in a positive PDO since about 1976, so we may be due for a long-term change in phase.



Three-month, December - February, temperature outlook prepared by the Climate Prediction Center.

This tele-connection is not nearly as well studied or understood as ENSO, but preliminary local research has revealed some interesting information. Specifically, there appears to be a much stronger relationship between the PDO, average winter temperature, and seasonal snowfall for Southeast Alaska than exists with La Niña. The correlation coefficient of the sign of the PDO index (positive or negative) to departure from average winter temperature is approximately 0.67. Moreover, the correlation coefficient of the sign of the PDO index to departure from average winter snowfall totals is approximately 0.55. Winters with negative PDO indexes usually end up colder and snowier than average. Winters with positive PDO indexes usually end up warmer and less snowy than normal.

So what might this mean for our upcoming winter? The latest PDO index value is from September and is -1.61, which is a moderately strong negative PDO. This compares closely with the values leading up to and then extending through the winter of 2008-2009 when the values ranged from -1.25 to -1.65. The 2008-2009 winter season ended up much colder and snowier than average across the Panhandle of Alaska. Total seasonal snowfall was 180.3 inches in Juneau and 83 inches for the Ketchikan area. “Normal” seasonal snowfall for these two locations is 94.7 inches and 44.6 inches, respectively. Moreover, if you like snow, here is some more good news: the PDO index has been negative since last June and has been getting more so every month since then.

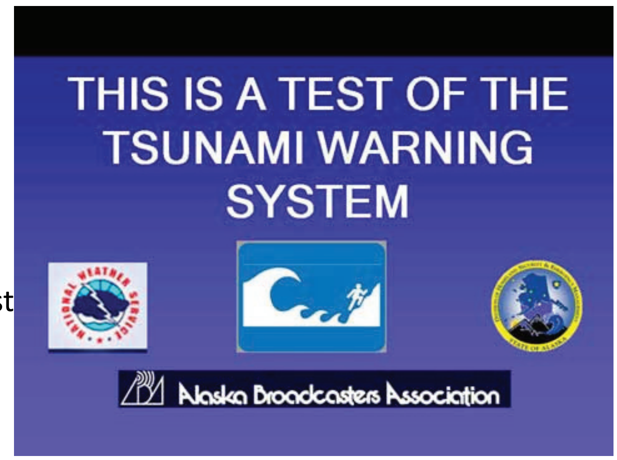
The Climate Prediction Center (CPC), located in Camp Springs Maryland, has released its Winter Outlook for the 2010-2011 Winter season. CPC is predicting the 3-month period from December through February to end up with below normal temperatures for nearly all of Alaska – including the Panhandle. This coincides with the traditional understanding of how La Niña affects the United States during the winter. And with a coinciding negative PDO index, the possibility exists of more snow than average.

In summary, I think that Southeast Alaska can look forward to a colder than normal, and probably more snow than normal, this winter.

NOAA All-Hazards Weather Radio on TV?

By Tom Ainsworth

National Weather Service (NWS) warnings are disseminated across many different mediums as soon as the forecaster sends the alert. Important information about floods, tsunamis, and blizzards, for example, along with certain announcements from NWS partners dealing with public safety and emergency response (e.g., hazardous material release, child abduction) stream across a variety of circuits to reach as many different people as possible as soon as possible. In today's society of instant information, the web, automated email services, and "reverse 911" automated calls can be used to deliver the message to homes, businesses, and individual mobile devices. One of the longest serving methods of warning dissemination, the Emergency Alert System, utilizes NOAA All-Hazards Weather Radio broadcasts to trigger the warnings to play on radio and television stations.



How does this work? When a NWS office broadcasts a warning for potentially damaging weather, or for non-weather related emergencies, the message includes a digital "special area message encoder" (SAME) code. The SAME code contains information describing the type of hazard occurring or predicted to occur, the borough from which the message was sent, and the time the message expires or requires updating. Local NWS Forecast Offices, broadcasters, and emergency response agencies have formally agreed certain types of events warrant interrupting radio and TV broadcasts immediately to allow the information to go on the air. For radio stations, the NOAA All-Hazards Weather Radio message is played directly on the air. Commercial television channels will cut away from their programming to a blank screen (often black or blue in color) and scroll a pre-scripted written message on the screen while the NOAA audio message plays in the background. Messages usually last less than a minute but can go longer depending on the complexity of the warning being disseminated. The parties involved test the process at least weekly: NWS Juneau initiates a test each Wednesday around 10 a.m. – unless a warning is already in effect.

It is important for TV viewers to note the audio message and the pre-scripted text messaging may not be exactly the same. The audio message playing will have complete details. The text identifies the type of event, the borough the Weather Radio message originated from, and the time the message expires – which could be much sooner than when the hazardous event is predicted to pass. Because Alaska boroughs are so large, the SAME code allows a specific portion of the borough to be identified, e.g., "West Prince of Wales – Outer Ketchikan" may be used to convey warnings that will affect Craig, and "East Juneau" to specify a warning applies to the city of Juneau. Satellite TV subscribers only see EAS alerts while viewing "local channels".

Alaska broadcasters, emergency planning agencies, and the National Weather Service have teamed up to ensure public warnings for the protection of lives and property are received across the state in timely fashion. A wide variety of audio, video, and wireless technologies are utilized to carry out this mission. You can find out more information about NOAA All-Hazards Weather Radio and the Emergency Alert System online at http://www.nws.noaa.gov/nwr/ and by calling the Juneau Forecast Office at (907) 790-6800.

The Long Range Forecast: National Weather Service Releases Its Strategic Plan
By NWS Communications Office

Weather, water, and climate affect each of us every day: tornados and floods threaten life and property; snow, fog, and thunderstorms disrupt air traffic; high winds and waves threaten lives at sea; long term droughts reduce food production and increase wild fire danger. The National Weather Service has the responsibility to provide weather, water and climate information to protect life and property and enhance the economy. We have met this responsibility with determination for many years.

Today, our science and services continue to evolve and improve to meet emerging needs. For example, NWS forecasters are working closer than ever with emergency responders to prepare for and avoid the impacts of natural and human-caused events. "Space weather" prediction and warnings are helping protect our Nation's telecommunications infrastructure. Climate outlooks are contributing to the management of the Nation's water resources, energy supply and food security. We are also responding to the changing ways people communicate, network, and share information, and we are using new technologies to make information more accessible and interactive.

However, population growth, vulnerable infrastructure, and an increasingly interdependent economy are creating new challenges for the Nation including increased vulnerabilities to weather and climate. At the same time, science and technology are rapidly advancing and providing potential solutions that will enable the National Weather Service to better meet our country's needs.

This past July, National Weather Service Director, Dr. Jack Hayes, released our agency's draft Strategic Plan for the decade 2010-2020. To achieve the agency's vision for 2020 ("A safe, healthy, and productive society through trusted weather, water, and climate information"), the plan provides a strategic framework that will guide our organization and investment over the next ten years. Our Strategic Plan is derived from NOAA's Next Generation Strategic Plan. It is based on the challenges and trends identified by our employees, partners, and users.

There are six key elements to the plan:

1. Improve weather decision services for events that threaten safety, health, the environment, economic productivity, and homeland security (e.g., strive to better understand and convey the impacts predicted weather will have on citizens).

2. Deliver a broad suite of improved water services to support management of the Nation's water supply (e.g., expand water forecasting capabilities focusing on climate-related impacts).

3. Enhance climate services to help communities, businesses, and governments understand and adapt to climate-related risks (e.g., deepen scientific understanding of climate, deliver climate services from global scales to local scales, and improve public knowledge of the impacts of a changing climate).

4. Improve sector-relevant information in support of economic productivity (e.g., while honoring appropriate boundaries between NWS and America's private weather and climate industry, this goal seeks to provide environmental information to help America's energy, aviation, transportation, and marine service industries to better anticipate, plan, and make key decisions to increase economic productivity and protect lives and livelihoods).

5. Enable integrated environmental services supporting healthy communities and ecosystems (e.g., accelerate research to operations and link weather, water, and climate with biological, chemical, ecological, and other processes to reduce the impact of environmental hazards on healthy communities and ecosystems).

6. Sustain a highly-skilled, professional workforce equipped with the training, tools, and infrastructure to meet our mission (e.g., increase interdisciplinary skills across the workforce (such as ecology, health, social sciences, economics and communications) and expand information technology capabilities throughout our facilities).

We hope this strategy will prepare NWS to meet the challenges and opportunities of the future. There will be a continuing need to deliver today's mission as we expand our services to meet the Nation's emerging needs for environmental information. This strategic plan is our best effort to anticipate service needs in the next 10 years, project what science and technology will allow, and establish meaningful outcome-oriented goals and objectives for NWS 2020.

You are welcome to send comments on our Strategic Plan to the Juneau Weather Forecast Office either by phone (907-790-6800) or email (nws.ar.pajk.webauthors@noaa.gov).

Trivia

1. **What is the coldest cloud-top temperature ever measured by satellite?**
   a) -40°F b) 32°F c) -152°F d) -135°F

2. **At what temperature does sea water freeze?**
   a) 32°F b) 35°F c) 30°F d) 28°F

3. **Benjamin Franklin invented which weather device?**
   a) wind vane b) lightning rod c) barometer d) thermometer

4. **At what angle is Earth's axis of rotation offset from vertical?**
   a) 25 degrees b) 23 degrees c) 23.5 degrees d) 24.3 degrees

5. **Known as "absolute zero", what is the coldest temperature possible in the Universe?**
   a) -150°F b) -40°F c) -850°F d) -460°F

6. **At what altitude in the atmosphere must you reach for the sky to begin noticeably turning black?**
   a) 200,000 feet b) 100,000 feet c) 300,000 feet d) 75,000 feet

Trivia Answers: ***1.*** *-152°F In 1990, a weather satellite measured a cloud top temperature of -152°F in Tropical Cyclone Hilda near Australia.* ***2.*** *28°F The actual freezing point of sea water depends on the amount of salt in the water, but in general, well-mixed open-ocean sea water freezes at around 28 degrees Fahrenheit.* ***3.*** *Lightning rod.* ***4.*** *23.5 degrees. This angle causes Earth's seasons as the poles alternately point toward or away from the sun during our orbit each year.* ***5.*** *-460°F At this temperature, all molecular activity ceases. Since temperature is a measure of the kinetic energy of molecules, an object at absolute zero actually has no molecular motion and, therefore, no longer has a temperature. The Kelvin temperature scale is based on this, and is the only temperature scale that begins at true "zero".* ***6.*** *Around 100,000 feet. If you have flown on a commercial airliner, you may have noticed the sky becoming darker blue at cruising altitudes of 30,000 to 35,000 feet; however a sharp delineation between blue and black is more apparent at around 100,000 feet, or nearly 19 miles high.*

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This quarterly educational newsletter is designed for Southeast Alaska's volunteer weather spotters, schools, emergency manager, and the news media. All of our customers and partners in Southeast Alaska are welcome to subscribe to it.

NOAA's National Weather Service Forecast Office in Juneau, Alaska is responsible for weather forecasts and warnings from Cape Suckling to the Dixon Entrance.

This publication, as well as all of our forecasts and warnings, are available on our web site: http://pajk.arh.noaa.gov.

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